
फॉस्फर कांस्य की छड़ें एवं सलाखें
(दूसरा पुनरीक्षण)

Phosphor Bronze Rods and Bars
(Second Revision)

ICS 77.120.30

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FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards after the draft finalized by the Copper and Copper Alloys Sectional Committee had been approved by the Metallurgical Engineering Division Council.

This standard was originally published in 1975 and subsequently revised in 1985. While reviewing the standard, in the light of experience gained during these years, the Committee decided to revise it to bring in line with the present practices being followed by the Indian industry.

In the revision, the following changes have been made:

- a) Amendments No. 1, 2, 3 and 4 have been incorporated;
- b) A new grade CuSn8 has been incorporated.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

PHOSPHOR BRONZE RODS AND BARS

(Second Revision)

1 SCOPE

This standard specifies the requirements for phosphor bronze rods and bars.

2 REFERENCES

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

| <i>IS No.</i> | <i>Title</i> |
|--------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| 1387 : 1993 | General requirements for the supply of metallurgical materials |
| 1608 (Part 1) : 2018/ ISO 6892-1 : 2016 | Metallic Materials — Tensile Testing: Part 1 Method of Test at room temperature (fourth revision) |
| 2826 : 1986 | Dimensions for copper and copper alloy rod and bar for General engineering purposes (<i>third revision</i>) |
| 3288 (Part 1) : 1986 | Glossary of relating to copper and copper alloys: Part 1 Materials (<i>third revision</i>) |
| 4027 | Methods of chemical analysis of bronzes: |
| (Part 1) : 1987 | Determination of copper and lead by electrolytic method (<i>first revision</i>) |
| (Part 2) : 1987 | Determination of manganese — Photometric method (<i>first revision</i>) |
| (Part 3) : 1987 | Determination of phosphorus Volumetric method (<i>first revision</i>) |
| (Part 4) : 1987 | Determination of nickel-dimethylglyoxime photometric method (<i>first revision</i>) |
| (Part 5) : 1987 | Determination of tin-iodimetric method (<i>first revision</i>) |

| <i>IS No.</i> | <i>Title</i> |
|------------------|------------------------------------------------------------------------------------------------------------|
| (Part 6) : 1987 | Determination of zinc by complexometric (EDTA) method (<i>first revision</i>) |
| (Part 7) : 1990 | Determination of antimony by rhodamine B spectrophotometric method (<i>first revision</i>) |
| (Part 8) : 1991 | Determination of iron (<i>first revision</i>) |
| (Part 9) : 1991 | Determination of aluminium by atomic absorption spectrometric method (<i>first revision</i>) |
| (Part 10) : 2000 | Determination of silicon (<i>first revision</i>) |
| (Part 11) : 2000 | Determination of lead-ethylenediamine tetraacetic acid (EDTA)-titrimetric method (<i>first revision</i>) |

3 TERMINOLOGY

3.1 For the purpose of this standard, the following definitions shall apply.

3.1.1 Rod/Bar — A solid wrought product of uniform cross section along its whole length, supplied in straight length or coil form, whose width or greatest distance between parallel faces is greater than 6 mm.

4 SUPPLY OF MATERIAL

General requirements relating to the supply of material shall conform to IS 1387.

5 FREEDOM FROM DEFECTS

The material shall be free from porosity and other defects.

6 CONDITION

The material shall be suitably stress-relieved, if required by the purchaser.

7 CHEMICAL COMPOSITION

7.1 The material shall have the chemical composition as given in Table 1.

Table 1 Chemical Composition
(Clause 7.1)

| Sl No. | Material Designation | Percent Sn | Percent Pb Max | Percent Fe Max | Percent P | Percent Ni Max | Percent Zn Max | Percent Total Impurities Max | Percent Cu |
|--------|----------------------|------------|-------------------|-------------------|-----------|-------------------|-------------------|------------------------------------|------------|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| i) | CuSn5 | 4.2-5.5 | 0.05 | — | 0.02-0.40 | — | 0.30 | 0.50 | Remainder |
| ii) | CuSn8 | 7.5-9.0 | 0.05 | 0.10 | 0.02-0.40 | 0.30 | 0.30 | 0.30 | Remainder |

7.2 The chemical composition shall be determined either by the method specified in IS 4027 or any other established instrumental/chemical method. In case of dispute, the procedure specified in IS 4027 shall be the referee method.

8 MECHANICAL PROPERTIES

The material when tested for tensile test in accordance with IS 1608 (Part 1) shall conform to the requirements given in Table 2.

9 SIZES AND TOLERANCES

9.1 Sizes

The material shall be supplied in any of the sizes specified in IS 2826 or as agreed by the purchaser and the manufacturer.

9.2 Tolerances

The tolerance for rods/bars shall be as given in IS 2826.

10 SAMPLING AND CRITERIA FOR CONFORMITY

Unless otherwise decided by mutual agreement of the purchaser and the supplier, the following sampling procedure and criteria for conformity shall hold good.

10.1 Lot

All the rods/bars of same dimensions, and manufactured under similar condition of production shall be grouped together to form lots of not more than 1 000 kg in mass. If the consignment exceed 1 000 kg, two or more lots

shall be formed and each lot shall be sampled separately for acceptance purposes.

10.2 From each bundle, 10 rods/bars shall be selected at random and examined for visual and dimensional requirements. A rod/bar which fails in one or more of the requirements shall be termed as 'defective'. From the samples examined in each bundle not more than one defective shall be permitted. If this is exceeded, all the material in the bundle shall be subject to visual and dimensional inspection.

10.3 Chemical Composition and Mechanical Properties

The following shall be the number of tests for chemical composition and mechanical properties requirements in the lot.

| Specified Size (Diameter or Width Across Flats) of the Material | | Number of tests for Chemical Composition and Mechanical Properties |
|--------------------------------------------------------------------------|------------------------|--------------------------------------------------------------------------|
| Over | Up to and Including | |
| mm | mm | |
| — | 12 | One for every 250 kg or part thereof |
| 12 | 40 | One for every 500 kg or part thereof |
| 40 | 80 | One for every 1 000 kg or part thereof |
| 80 | — | One for every 2 000 kg or part thereof |

10.3.1 For this purpose the sample may be selected

Table 2 Mechanical Properties of Phosphor Bronze Bars/Rods
(Clause 8)

| Sl No. | Material Designation | Size (mm) | | Condition | Tensile Strength MPa <i>Min</i> | 0.2 Percent Proof Stress MPa <i>Min</i> | Elongation on Gauge Length of $5.65 \sqrt{S_0}$ <i>Min</i> Percent |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------|---------------------|-----------------|---------------------------------------|-----------------------------------------------|-----------------------------------------------------------------------------|
| | | Over | Up to and Including | | | | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| i) | CuSn5 | 6 | 18 | As manufactured | 500 | 410 | 12 |
| | | 18 | 40 | -do- | 460 | 380 | 12 |
| | | 40 | 70 | -do- | 380 | 315 | 16 |
| | | 70 | 100 | -do- | 315 | 235 | 20 |
| | | 100 | 120 | -do- | 275 | 118 | 22 |
| | | 120 | — | -do- | 255 | 80 | 25 |
| ii) | CuSn8 | 6 | 18 | -do- | 550 | 400 | 15 |
| | | 18 | 40 | -do- | 500 | 360 | 18 |
| | | 40 | 60 | -do- | 450 | 300 | 20 |
| NOTE — For rods/bars required for electrical purpose, the conductivity resistivity required as well as physical properties shall be as agreed to between the purchaser and the manufacturer. | | | | | | | |

from rods/bars which have been examined and found satisfactory for visual and dimensional requirements.

10.3.2 The lot shall be accepted if the samples tested meet all the chemical composition and mechanical properties requirements of the specification.

11 RETESTS

11.1 If the test results of chemical analysis fail to satisfy the requirements for any of the constituents, two more tests for that constituents shall be done on the sample in order to confirm that the analysis has been done properly. If both the test results satisfy the relevant requirement, the lot shall be considered as conforming to the specification, otherwise not.

11.2 If any one of the samples first selected for mechanical test fail, two further samples from the same lot shall be taken one of which shall be from the rod/bar from which the original sample was taken unless the same rod/bar is withdrawn by the supplier.

11.2.1 If both these additional samples pass, the lot represented by the samples shall be deemed to comply

with this standard. Should either of these additional samples fail, the lot represented by the samples shall be rejected.

12 PACKING

The material shall be supplied in bundles and strapped with loops and shall be suitably packed to avoid damage during transit or as required by the purchaser.

13 MARKING

13.1 Suitable tags with marking made on them to show the name of the manufacturer, size, lot number, mass and any such information required by purchaser, shall be attached to each bundle of the material.

13.1.1 The material may also be marked with the Standard Mark.

13.1.2 The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the BIS Act, 2016 and the Rules and regulations framed thereunder, and the products may be marked with the standard mark.

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This Indian Standard has been developed from Doc No.: MTD 08 (5294).

Amendments Issued Since Publication

| Amend No. | Date of Issue | Text Affected |
|-----------|---------------|---------------|
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